Assignment 01

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Question 1:

In 1950, Alan Turing ignited a debate that continues to spark discussion today, can machines truly think? He introduced the Turing Test and addressed several objections to machine intelligence. Decades later, some of these concerns remain relevant, while others seem less persuasive given technological advancements.

One objection that still holds weight is the idea that machines operate strictly within predefined rules and, therefore, cannot replicate the fluid, unpredictable nature of human behavior. Critics argue that human actions are deeply influenced by emotions and intuition, making them difficult for machines to emulate. Turing countered that even seemingly spontaneous human behavior follows natural laws, which machines could, in theory, replicate. While this argument is intriguing, the concern persists that mimicking human actions is not the same as true understanding of consciousness.

Another significant challenge comes from Gödel's incompleteness theorems, which suggest that any formal system—including a computer—has inherent limitations. Some argue this means machines will always lack the intuition and insight that humans possess. Turing's response was that humans themselves are not infallible and have their own cognitive limitations. While his perspective is thought-provoking, it does not entirely dispel the belief that human reasoning involves something uniquely beyond computational processes.

Since Turing's time, AI has made remarkable progress, particularly in areas like deep learning and natural language processing. However, these advancements introduce new concerns. Modern AI excels at recognizing patterns and producing human-like text, but it fundamentally relies on statistical probabilities rather than true comprehension. Additionally, ethical concerns—such as bias and transparency in AI systems—have emerged, adding complexity to the discussion on machine intelligence.

Turing also predicted that by 2000, a computer would have a 30% chance of passing a five-minute Turing Test with an unskilled interrogator. While this may seem like a modest claim today, his prediction was surprisingly accurate in some cases. Contemporary chatbots can often mimic human responses convincingly in brief exchanges, but they struggle with deeper, more sustained conversations and lack genuine understanding. This suggests that while Turing's estimate captured part of the reality, passing the test does not necessarily equate to true intelligence.

Ultimately, Turing's work continues to influence the discourse on artificial intelligence. The objections he addressed—including the limitations of formal rules, the complexities of human cognition, and the nature of real understanding—are still debated today. His counterarguments encourage new ways of thinking, though they do not resolve the issue entirely. As technology advances, fresh questions and challenges emerge, reinforcing that the quest for truly intelligent machines is as much a philosophical and ethical pursuit as it is a technological one.

Question 2:

1. Yes, playing a game of table tennis is possible but challenging. Advanced robots such as those developed by the company named Omron are capable of playing table tennis.
2. Yes, playing a game of bridge at a competitive level is possible. Examples of such AI technologies include programs such as NooK and DeepBridge.
3. No, writing an intentionally funny story is not yet possible for AI, as although it is capable of generating jokes, inclusion of humor is not yet possible.
4. No, giving competent legal advice in a specialized area of law is not yet possible for AI. Providing competent legal advice in complex situations requires human judgement and understanding of nuanced contexts.
5. Although AI has evolved to the extent that it assists a great deal in solving mathematical problems, it is still not smart enough to discover and prove a new mathematical theorem. Such tasks require deep understanding beyond pattern recognition, moreover AI still lacks human-like creativity.
6. Yes, performing a surgical operation is now possible for AI. Da Vinci Surgical System is an example of such an AI-assisted robotic system.
7. No, this task is currently impossible for AI to perform due to the differences of dishwasher designs, dish placements, dish types, and dish sizes.
8. No, constructing a building completely is not yet possible for AI. AI does contribute in construction works but fully autonomous construction is not yet possible. As human intelligence is still required for planning, and adjusting to environmental factors.

Question 3:

- Agent Description:
  Agent is an autonomous vehicle. The vehicle perceives its environment using cameras, and sensors. The vehicle itself is completely responsible for actions such as braking and accelerating.
- Environment for the vehicle is partially accessible as while driving there must be some blind spots for the cameras.
- Environment is stochastic as there exist unpredictable elements in the environment such as changing weather conditions and other vehicles.
- Environment is sequential as each decision has an impact on the future decisions needed to be taken.
- Environment is dynamic since it continuously changes.
- Environment is continuous as the vehicle's autonomous system has a continuous flow of input.
- Best agent architecture for the autonomous vehicle is a Hybrid Agent as it combines Model-Based reasoning, Deep Learning, and Reinforcement learning. Deep learning helps in identifying objects in the environment from the percepts received through cameras and sensors. Through reinforcement learning the agent learns optimal driving through trial and error methods.

Question 4:

1. False
   In a poker game the agent does not have complete knowledge of the opponent's cards but it can still make rational decisions using probabilities and the information it has.
2. True
   In autonomous driving, a reflex agent can not behave rationally as driving requires memory, and anticipation of future events..
3. True
   In an environment where the goal is to exit and all possible movements result in the same outcome every agent will be rational.
4. False
   Agent program takes the current percept as the input while the agent function takes the entire percept sequence as its input.
5. False
   Limitations in computational resources and complexities of certain

functions make it impossible to implement every agent function. An agent requiring an infinite amount of memory can not be implemented.

6. True
   Exploration task where all possible moves help reach the goal at the same cost.
7. True
   An agent that always moves towards a goal can be rational in both a grid and a maze environment.